

# City of Los Angeles

# Building & Safety

SFPE PRESENTATION – NOVEMBER 14<sup>TH</sup>, 2023

- FIRE PUMP – INSPECTION AND TESTING REQUIREMENTS
- FIRE WATER STORAGE TANKS – INSPECTION AND TESTING REQUIREMENTS

# High Rise Buildings - Fire Pump Requirements

- ▶ A High Rise Building is defined as having occupied floors located more than 75 feet above the lowest level of fire department vehicle access.
- LABC 2022 ed. Section 403
- NFPA 14 2019 ed. Section 3.3.9
- NFPA 20 2019 ed. Section 3.3.30

# FIRE PUMPS Types:



ELECTRIC INLINE FIRE PUMP



DIESEL HORIZONTAL SPLIT CASE



ELECTRIC VERTICAL LIFT

# High Rise Buildings - Fire Pump Requirements

- ▶ Buildings that have an occupied floor that is more than 120 feet above the lowest level of fire department vehicle access have specific water supply requirements:
  - Two water supplies are required. (LABC 2022 ed. 403.3.2)
  - Each water supply shall have its own backflow device of the same size as the meter size provided. (LADWP rule 16D)
  - After the backflow devices, both services may be tied together and supply the fire water storage tank and city bypass.

# High Rise Buildings - Fire Pump Requirements

- ▶ Buildings with an occupied floor more than 200 feet above the lowest level of fire department vehicle access has specific requirements for fire pump design:
  - Two fire pumps shall be required of the same GPM and PSI for redundancy. (LABC 2022 ed. Section 403.3.2.1)
  - Emergency power is required to supply all fire pumps running at the same time. (LABC 2022 ed. Section 9.13.6)

# High Rise Buildings - Fire Pump Requirements

- ▶ Buildings that have an occupied floor more than 420 feet above the lowest level of fire department vehicle access have specific fire sprinkler system supply requirements:
  - LABC 2022 ed., Section 403.3.1 requires:
    - 1) Two floor control valves for each sprinkler system in the building.
    - 2) Each sprinkler system shall be supplied from separate standpipes.
    - 3) Each sprinkler system shall be designed so that either standpipe connection to the sprinkler system is capable of supplying the system demand.
  - No hose valves or floor control valves can exceed 400 psi, NFPA 14 2019 ed. Section 7.2.1

# Fire Department Connection for High Rise Buildings

- ▶ All fire department connections shall be approved by LAFD.  
(LABC 2022 ed. Section 9.12.2 and 912.4)
- ▶ All high rise buildings shall require two fire department connections and shall be on different sides of the building.  
(NFPA 14 2019 ed. Section 7.12.2.2)
- ▶ Each fire department connection shall also function as a manual tank fill if there are two zones, this shall provided from the low zone.  
(LAFD requirement)

# Fire Pump Room Rough and Hydro Inspections

- ▶ Location of the fire pump room shall be approved by the Fire Department. (LAFD)
- ▶ Obtain approved plans that match the installation.
- ▶ Check locations of all devices to make sure they are in the proper location. (check valves, relief valves, control valves, etc.)
- ▶ Check all seismic bracing for installation as per the approved plans.
- ▶ Check all flexible/ridged couplings to ensure they are installed in the proper locations and that all materials meet the required pressure rating.
- ▶ All drains: main, casing relief, packing gland, relief valves shall be installed and in the proper location.
- ▶ Check all sensing line for fire pumps and jockey pump. The point of connection into the system shall be between the discharge check valve and control valve. Sensing lines shall be of non metallic material.
- ▶ Provide hydrostatic test for all piping on both sides of the fire pump flanges, test shall be 200 psi for 2 hours or 50 psi higher than churn pressure.



# Fire Pump Room Approval To Test

- ▶ A Fire Pump Room Pre-Test Clearance form must be completed prior to pre-testing or acceptance testing of the fire pump(s) is performed.
- ▶ LADBS and LAFD inspectors shall sign off of completion of necessary equipment in the Fire Pump Room prior to testing.
- ▶ After this form is completed it should be emailed to the LADBS fire sprinkler inspector.

LADBS DEPARTMENT OF BUILDING AND SAFETY		FIRE PUMP ROOM PRE-TEST CLEARANCE	
Job Address: _____			
APPROVED PLANS AND INSPECTION RECORDS MUST BE AVAILABLE AT THE JOB SITE. THE FOLLOWING CLEARANCES, A COPY OF STREET USE PERMIT AND FIRE PUMP PRE-TEST ARE REQUIRED PRIOR TO SCHEDULING THE FIRE PUMP TEST WITH LADBS FIRE SPRINKLER INSPECTION.			
<b>BUILDING INSPECTION</b>			
Fire Pump Room Completed. _____			
Date: _____ Inspector: _____			
<b>MECHANICAL INSPECTION</b>			
Fire Pump Room Ventilation Completed. _____			
Date: _____ Inspector: _____			
<b>PLUMBING INSPECTION</b>			
Fire Pump Room Drainage Completed. _____			
Date: _____ Inspector: _____			
Roof Drains Completed. _____			
Date: _____ Inspector: _____			
<b>ELECTRICAL INSPECTION</b>			
Fire Pump Electrical Wiring Completed. _____			
Date: _____ Inspector: _____			
Emergency Generator Completed. _____			
Date: _____ Inspector: _____			
<b>FIRE DEPARTMENT</b>			
Fire Pump Room / Clearance To Test. _____			
Date: _____ Inspector: _____			
<b>STREET USE</b>			
Special Requirements: _____			
Date: _____ Inspector: _____			
<small>As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability, and upon request, will provide reasonable accommodations to ensure equal access to its programs, services and activities.</small>			
<small>INForm.042 Rev. 10/05/2016</small>		<small>Page 1 of 2</small>	<small>www.ladbs.org</small>



# Fire Pump Acceptance Testing

- Start fire pump to obtain the churn pressure.
- Pressure relief valves shall be set at the start of the test while pump is running at churn, relief valve should just trickle.
- All fire pumps that are not fixed speed are required to have a pressure relief valve.
- Inline fire pumps and horizontal split case fire pumps require a minimum of 3/4" relief valve that goes to floor sink. This keeps the fire pump cool at churn pressure. Very important that the floor sink keeps up with flow.
- Vertical fire pumps requires a minimum 1 1/2" air release.
- Perform all manual and automatic starts 6 of each. On both normal and emergency power.

# Fire Pump Flow Testing:

- Flow test through the test header, obtain all required flow points, typically 50%, 100% and 150%.
- Fire pumps with a Pressure limiting device (PLD) Diesel only, or variable speed controller electric only. Require test without the device flow through test header at 50%, 100, and 150% and with the device 25%, 50%, 75%, 100%, 125%, and 150%.



TEST HEADER RETURNING TO  
WATER STORAGE TANK



CERTIFIED TEST EQUIPMENT  
example of Pitot Gauge



FLOW TESTING WITH PLAYPIPES  
AND DIFFUSERS

# Fire Pump Testing (continued)

- Setting of the pressure for fire/jockey pump controllers. Example: Churn pressure 165 psi.
- Jockey pump Start 150 psi / Stop 165 psi.
- Fire Pump Start 135psi / Stop 10 psi below churn 155 psi.
- Perform roof flow test from fire hose valves, typically if the fire pump GPM is 750, flow test 750GPM at 100 psi, this can be done by flowing the most remote hose valve at 500 GPM and 250 GPM at the other stair at 100 psi.
- All valves shall have signage stating what the valve is (test header, standpipe isolation, control valve, etc.) and what the normal position of the valve is (open/closed).
- All controllers shall have signs stating the stop and start pressures, minimum overrun timer of 10 minutes for electric or 30 minutes for diesel.
- If you have redundant fire pumps (two), pump #2 will have a 10 to 20 second delay, with the same start and stop pressure settings for both fire pumps. Also provide a sign stating this on the controller.

# Maintenance Pump (Jockey Pump) Controller Signage



# Fire Pump Controller Signage (Low Zone) Stop and Start Pressures







# Fire Pump Room - Identification of Piping

- ▶ LAFD requires all piping within the fire pump room be color coded.
- Discharge piping (red).
- Suction piping (white) if is coming from a tank.
- Water supply piping (green).
- Low zone (yellow) , Medium zone (orange), High zone (red). If you do not have but one zone discharge pipe (red).
- Test header piping (blue).



RALPH M. TERRAZAS  
FIRE CHIEF

March 29, 2017

TO: FDS Inspectors and Plan Checkers

FROM: Hani G. Malki, Senior Fire Protection Engineer  
Fire Development Services Section

SUBJECT: IDENTIFICATION OF PIPING IN FIRE PUMP ROOMS

In an effort to standardize complex piping arrangements to assist emergency responders, building engineers, and system testers; the following piping identification method shall be utilized. As of the date of this communication, all buildings which have not received final Certificate of Occupancy shall comply with the requirements contained in this memorandum:

1. Painting of fire pump room piping shall be as follows:
  - A. City supply piping shall be painted green in color
  - B. Test header piping shall be painted blue in color
  - C. Low zone discharge piping shall be painted yellow in color
  - D. Mid zone discharge piping shall be painted orange in color
  - E. High zone discharge piping shall be painted red in color
  - F. Pump suction piping from water storage tank shall be painted white in color
  - G. Tank fill piping (auto fill/city manual fill and FDC emergency tank fill piping) shall be painted green in color to match city supply piping
2. An approved piping color schedule shall be posted inside the fire pump room at the exit doorway. The schedule shall be protected from water damage.
3. Contractors shall coordinate painting of the piping inside the fire pump room with an LAFD Field Inspector and the LADBS Sprinkler Division Inspector. Contractors shall ensure that the LADBS Sprinkler Inspector requirements for pipe identification are complied with as per 2016 NFPA 13, Section 6.3.11. Fittings need not be painted.
4. Approved identification signage shall be provided for all valves inside fire pump room.

  
Hani G. Malki, Sr. Fire Protection Engineer  
Fire Development Services Section

# Fire Water Storage Tanks When Are They Required?

- All new high rise buildings over 75' from fire department access to the highest occupied floor. (LABC 2022)
- Existing commercial high rise buildings built prior to 1974 may utilize the City of LA – High Rise Retrofit Ordinance, adopted in Chapter 86, Section 8604 of the Los Angeles Building Code.

# Fire Water Storage Tank Size

- All new buildings size of tank is based on GPM'S of fire pump and the duration of the hazard. Light Hazard is 30 Min. Ordinary Hazard is 60 Min. Extra Hazard is 90 Min. Example: 750 GPM pump X 60 Min.= 45,000 Gallons of useable water.
- Existing commercial high rise buildings built prior to 1974:
  - 1) Retrofit Ordinance/Adaptive Reuse 75'- 150' no tank required. (LABC 2022, Section 8604.6.5.1)
  - 2) Retrofit Ordinance/Adaptive Reuse over 150' up to 275' minimum 20,000 gallon tank. (LABC 2022, Section 8604.6.5.2)
  - 3) Retrofit Ordinance/Adaptive Reuse over 275' minimum 40,000 gallon tank. (LABC 2022, Section 8604.6.5.3)

# Fire Water Storage Tank Size (Understanding Useable Water)

- ▶ The contractor will be required to take measurements while the LADBS inspector is on site, these measurements will be compared with the LADBS approved plans.
- ▶ Take into consideration any columns and subtract the area from the useable water.
- ▶ Take into consideration where the overflow location. Measure to the bottom of the hole. Subtract 6" that will be normal water line. So 6" below overflow to Minimum submergence would be the height. (Vertical lift pump)
- ▶ To get the volume of the tank, take the length X width X height X 7.48 = gallons

# Fire Water Storage Tanks Vertical Lift Pumps

Vertical Lift Pump - Take into consideration the draw down (minimum submergence). Listing and installation information should be on the approved plans or manufacturers pump data sheet.

## VERTICAL LIFT

A.3.3.25.3.2 Total Head (H), Vertical Turbine Pumps. See Figure A.3.3.25.3.2.

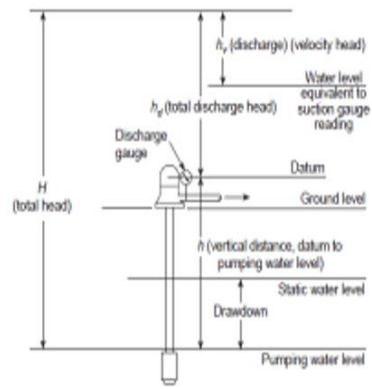
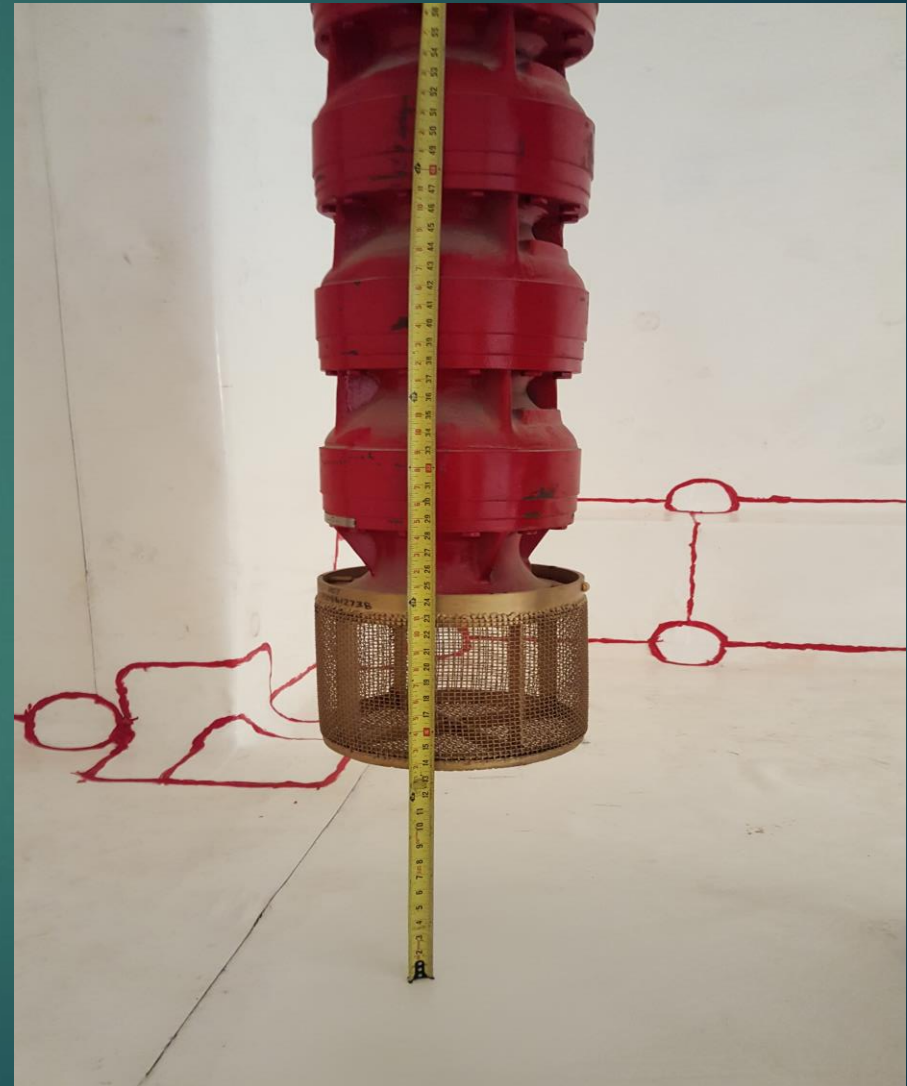
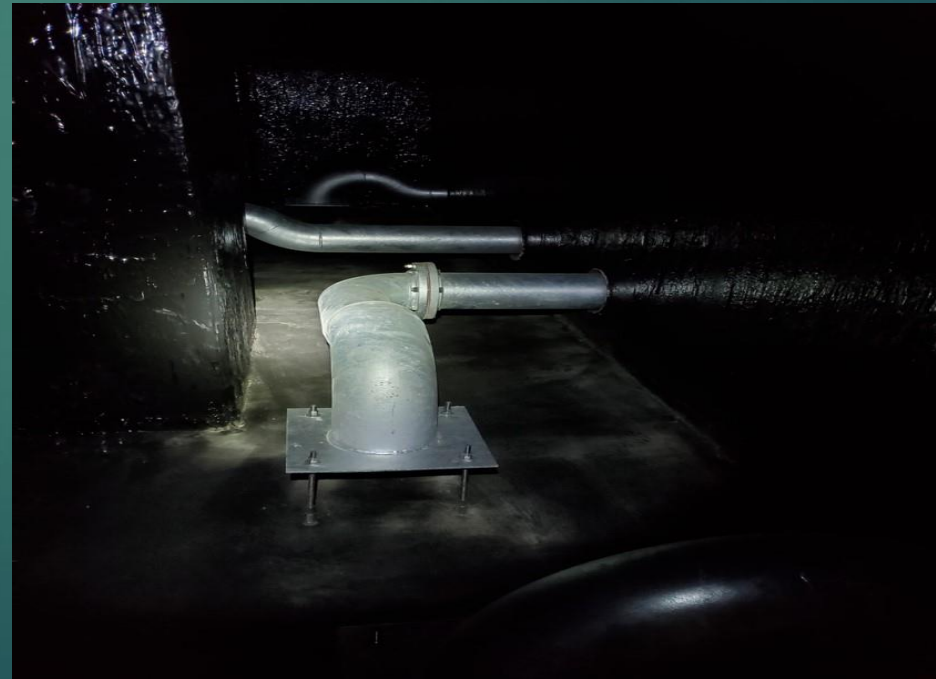
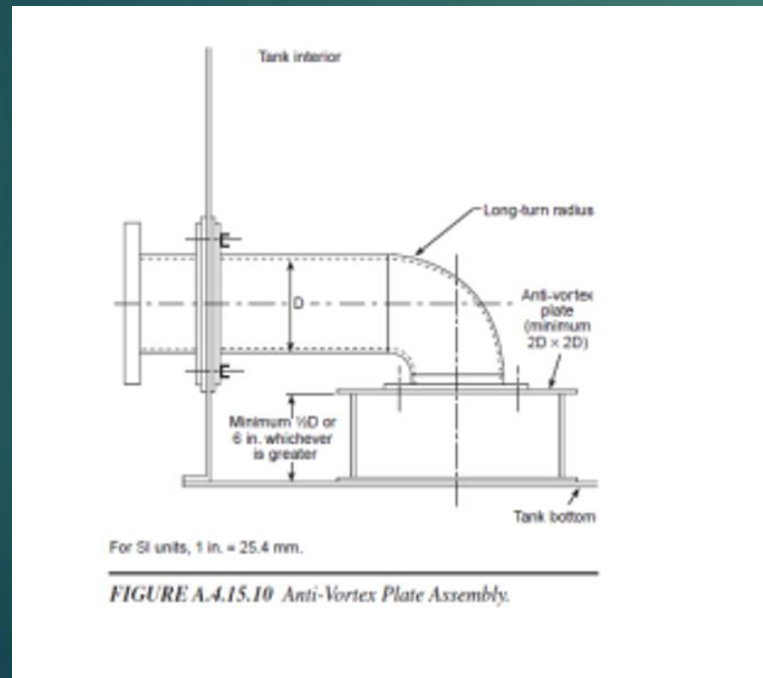


FIGURE A.3.3.25.3.2 Total Head of Vertical Turbine-Type Fire Pumps.



# Fire Water Storage Tanks Horizontal Pumps

- The vortex plate shall be a minimum 6" from bottom of tank. So from the top of vortex plate to 6" below overflow would be the height.
- Tanks with vortex plates shall have long turn radius elbows attached to the vortex plate. Vortex plate shall be 2X the size of the suction pipe. Example: 8" pipe = 16" vortex plate.



# Fire Water Storage Tank Liners

Questions and comments to ask contractor at the start of the project:

- ▶ What type of tank lining material will be used? Is this product approved for this application?
- ▶ Ask the contractor to give you all of the data sheets for the product.
- ▶ Deputy inspection will be required for the tank liner as per the ICC report. All reports will be given to the LADBS inspector before the tank is filled.
- ▶ City of LA approved third party test lab for products without Los Angeles Research Report (LARR) specific approval.

# Fire Water Storage Tank – 72 Hour Leakage Test

- ▶ Tank inspection will be conducted by LADBS inspector before tank is filled with water to check for debris in tank.
- ▶ If approved, inspector will give “ok to fill”, the tank shall be filled all the way up until water comes out of the overflow.
- ▶ Once tank is full LADBS can come check water level and take a measurement.
- ▶ Reinspection after 72 hours. At both of these inspections check outside walls of tank for leakage.





# Fire Water Storage - Tank Fill Valves

- ▶ All water storage tanks in the City of LA are required to have (1) manual fill valve, (1) FDC emergency tank fill valve and an LADBS approved tank auto-fill system. All of these fill valves are required to be designed to provide full replenishment of the Tank.
- ▶ The manual fill valve bypasses the LADBS required auto-fill valves. This valve is sized to fully replenish the fire pump system demand and is normally closed
- ▶ LAFD requires a 6" emergency fill valve, that shall be supplied through the FDC with a pumper truck during fire-fighting operations. This valve is also bypasses the auto-fill valves.
- ▶ The City of Los Angeles has adopted code amendments for all high-rise fire pumps to be installed with a tank auto-fill system. (LAPC 2022 ed., Chapter 20, Section 2050.2)
- ▶ All of these fill valves shall be located in the fire pump room.

# Fire Water Storage - Tank Fill Valves

- ▶ LAPC 2022 ed., Chapter 20, Section 2050.2
  - 2050.2 Water Tanks in High-Rise Buildings.
    - 1) One or more water tanks shall be installed to serve the fire sprinklers and standpipes in a high-rise building. No tanks shall serve more than one building, however, one water service may supply tanks for more than one building, structure or tower.
    - 2) The tank shall be supplied from the City water main via an automatic fill line. The auto-fill system shall be sized to replenish the water in the tank at a rate equal to, or greater than, the required fire pump capacity. The autofill lines shall be a minimum of two inches in diameter and shall not exceed a maximum of four inlets into the tank. The auto-fill system bypass shall be provided around all fill lines with a shut off valve that is normally closed. Means shall be provided to flow test the automatic fill valves individually and collectively. A minimum 2" tank auxiliary drain valve shall be required for all water storage tanks to accommodate testing.
    - 3) The capacity of the tank shall be based on the required standpipe demand capacity for the duration as specified in Table 19.2.3.1.2 of NFPA 13 edition or the requirements in Section 403.3.3 of the 2022 California Building Code, whichever is greater.

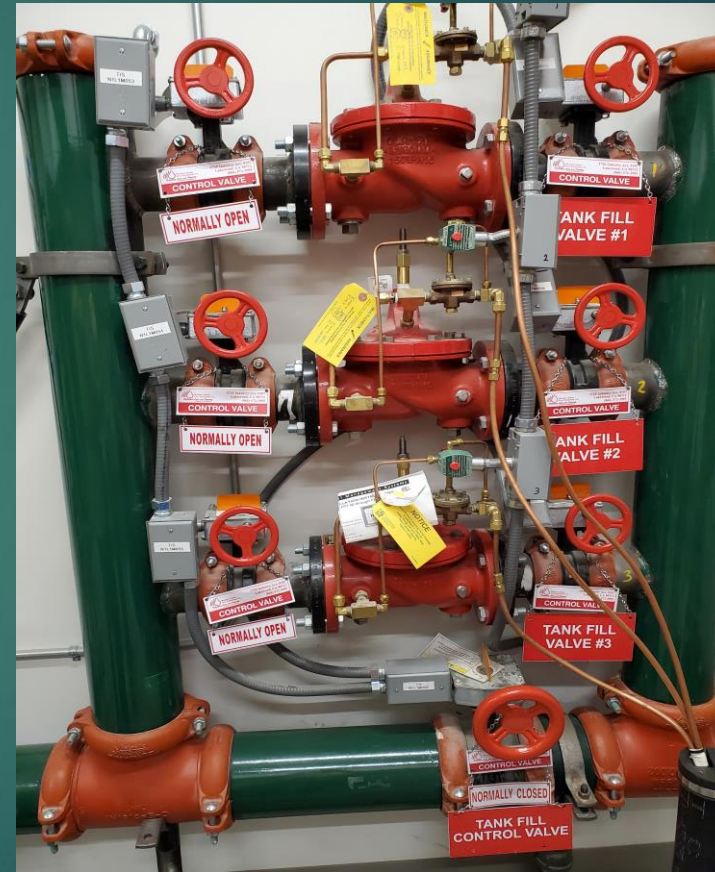
# Fire Water Storage - Tank Fill Valves

- ▶ If the fire pump is 1000 GPM then the tank will need to be replenished at 1000 GPM. So four fill valves 250 GPM each = 1000 GPM.
- ▶ Means of testing each fill valve separately is required at whatever GPM is required for the valve. Each auto-fill valve needs to be adjustable and the manufacturer sells the valve adjusters separately.
- ▶ After all valves are set to the proper GPM, a test of all the valves flowing together will be conducted to ensure the total GPM required is met. All flow test water shall discharge back to the tank.
- ▶ Two ways of testing:
  - (1) pipe the fill valves back through the test header
  - (2) set up a straight stream with pipe and use the same pitot tube you would use for the test header. See illustration on next slide.

# Fire Water Storage - Tank Fill Valves



(2) For this configuration, test through the slot with a pitot tube and a 2" pipe for straight stream.



(1) This configuration goes back to the tank, through the test header with valve that would allow water to go to the test header.

# Fire Water Storage Tank Auto-Fill System

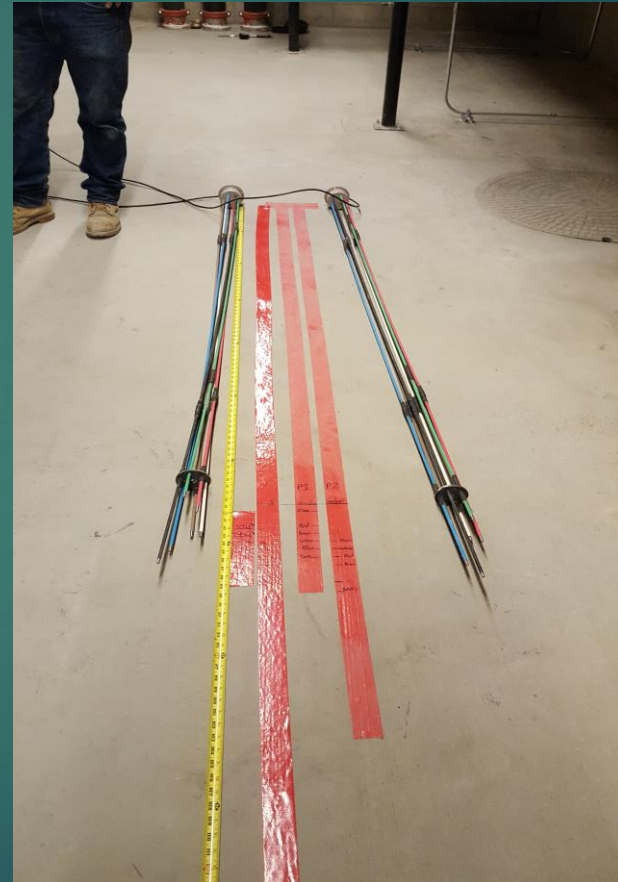
- ▶ Are probes being used to shut the auto-fill valves on and off?
- ▶ Are the fill valves being used with manual floats?
- ▶ For example if there is a four fill valve system and probes are being used. You need one probe for each action. One probe to turn the valve on and one probe to turn it off. For a total of eight probes.
- ▶ Also high water and low water signals need to be picked up. Each one will require a separate probe.
- ▶ LAFD requires that low water alarm comes on when there is a 12" vertical loss of water.



# Fire Water Storage Tank Fill System Probes and Panels



Notice the wires are long enough to remove the probes from the tank.



Have the contractor create a template on the ground. So the probes can be measured and matched up to the approved plans.

# Fire Water Storage Tank Overflow

- ▶ Questions to ask contractors:
  - Where does the overflow drain to? What size is the overflow pipe?
  - How many auto-fill valves are being used?
  - Is the termination approved per the LADBS approved plumbing plans?
- ▶ Once you know the above answers then you can figure out how much water will need to be factored into overflow drain.
  - Example: 1000 GPM fire pump replenish at 1000 GPM. Four fill valves at 250 GPM each = 1000 GPM.
  - This means the overflow drain will need to be designed and sized to accommodate the failure of the largest valve flowing 250 gpm.




# Fire Water Storage Tank Overflow

- ▶ The overflow pipe coming from the tank will go to a hub drain. Does the hub drain go directly to the sewer or to a storm water? Is the overflow drain by gravity? If it is a ejector system what size are the ejector pumps?
- ▶ Ask the contractor how many GPM are the ejector pumps sized for in the pit. Any water terminating into the ejector pumps must be included in sizing design of the overflow drain.
- ▶ Pumps need to be sized to pump out, in the example above, 250 GPM. LAFD requires the ejector pumps to be redundant and on a dedicated circuit on emergency power.

# Fire Water Storage Tank Overflow

- ▶ The LADBS website has an information bulletin for tank overflow design and installation requirements for fire protection systems.
- ▶ [www.ladbs.org/forms-publications/publications/information-bulletins-guidelines](http://www.ladbs.org/forms-publications/publications/information-bulletins-guidelines)



**INFORMATION BULLETIN/PLUMBING**  
REFERENCE NO.: LAMC 94.2050.0;  
NFPA 22 Sect. 14.6  
**DOCUMENT NO. P/PC 2014-010**  
Previously Issued As: P/PC 2011-010

Effective: 01-01-2014  
Revised:

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## SUCTION TANK OVERFLOW FOR PRIVATE FIRE PROTECTION SYSTEMS

**SCOPE**  
This Information Bulletin applies to the installation of overflows in suction tanks. Gravity and pressure tanks are beyond the scope of this bulletin.

**BACKGROUND**  
Aging buildings have had failures in the fill line solenoid valve resulting in flooding the pump room and the basement. The termination of the overflow has become a major issue and must be addressed early in the design phase.

**DEFINITIONS**

1. **Gravity Tank:** A tank that can provide the needed supply without the use of a pump. All the energy for the system is available from the height of the gravity tank.
2. **Pressure Tank:** A tank that can provide the needed supply without the use of a pump. All the energy for the system is available from the air pressure in the pressure tank.
3. **Suction Tank:** a tank installed in combination with a pump. The required energy for the system is provided by the pump.
4. **Sewage Ejector System:** A system used to lift the discharge from the fixtures located below the crown level of the sewer to the building drain or building sewer.
5. **Sump Pump System:** A system used for removing water from rainwater drains, subsoil drainage, emergency drains, or other systems not considered sewage.

**I. DISCHARGE LOCATION**

The overflow from the tank may discharge to the storm drain, under the street curb, the yard, the sewer, or any other location approved by the Department subject to the following conditions:

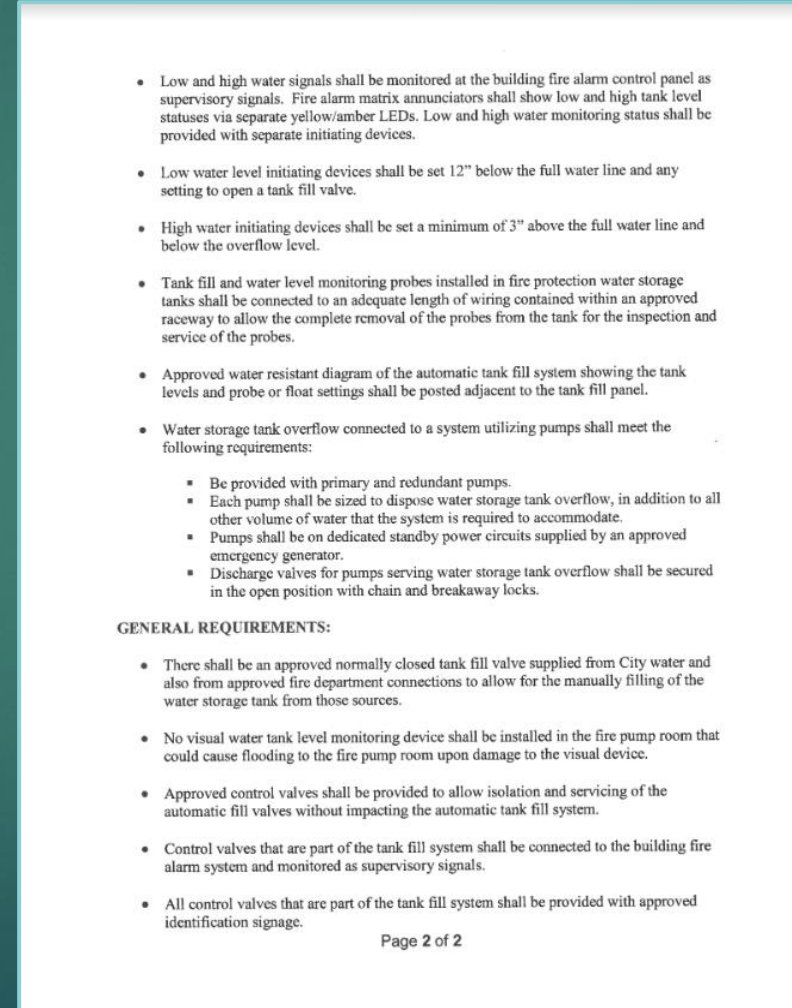
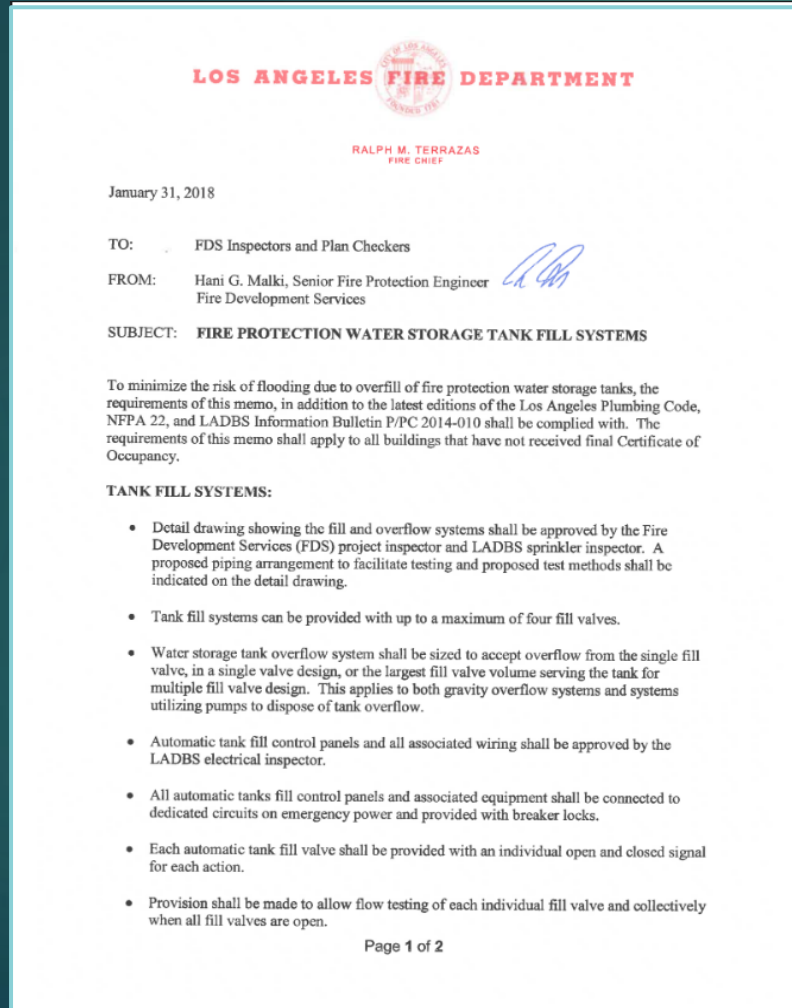
1. Discharge to the street curb or public storm drain is subject to the approval from the Bureau of Engineering, Department of Public Works.
2. When discharging to the yard, attention shall be paid not to let water sheet flow over the public sidewalk.

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability and, upon request, will provide reasonable accommodation to ensure equal access to its programs, services and activities. For efficient handling of information internally and in the internet, conversion to this new format of code related and administrative information bulletins including MGD and RGA that were previously issued will also allow flexibility and timely distribution of information to the public.

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# Fire Water Storage Tank Overflow

- ▶ LAFD has issued a memo in association with the LADBS information bulletin on Suction Tank Overflow for Fire Protection Systems.



# Fire Water Storage Tank Overflow Testing

- ▶ All auto-fill valves shall be set to the proper GPM for each valve per the design.
- ▶ All auto-fill valves shall flow water at the same time to prove the required fire pump demand replenishment rate.
- ▶ Then, one of the fill valves shall be “failed” in the open position (flowing) with the fire pump not in operation.
- ▶ Next, the inspector will visually inspect until water comes out of the overflow. This inspection will last for 20 to 30 minutes to make sure the overflow drain/ejector pump keeps up.
- ▶ If the overflow drain keeps up the test passes.

# Fire Water Storage Tank Information In More Detail - Internal

## TANK INSPECTION – CHECKLIST

### Water Storage Tank Inspection:

- 1) Verify tank size for usable gallons as noted on approved plans and per code:
  - a) Tank size(s) retrofit ordinance:
    - Building 75' high = Tank not required
    - Building 150' high = 20,000 gallons minimum
    - Building 275' high = 40,000 gallons minimum
  - b) Tank size(s) new construction:
    - Building 75' and higher, the most demanding system (standpipe or sprinkler) within the building.
- 2) Verify approved plans indicate:
  - tank location and construction size
  - locations and elevations of overflow and fill pipes
  - locations and elevations of water level indicators
  - vortex plate
  - stilling well
  - tank liner manufacturer and type
  - size, make, model and listing and/or approvals of all materials and devices installed for the water storage tank
- 3) Verify tank liner product and obtain documentation from tank manufacturer and/or reports as required by L.A.R.R., product listing or recognized LA City third party approval.
- 4) Check Tank for overflow (minimum 8"), fill pipe (tank fill system), vent, proper access, vortex plate (2x the size of suction pipe & min. 6" off bottom), bowl depth (basket 1' off bottom) and drawdown level (Minimum submergence) before approval to fill.
- 5) Establish High, Normal and Low water level alarm elevations for probe length per approved fire sprinkler plan.
- 6) When all of the above are completed, give approval to fill water storage tank and allow scheduling of the 72 hour Tank leakage test inspection

### Tank Fill and Overflow Inspection:

Before or during the Fire Pump rough inspection, verify the Tank Fill Systems and Overflow and go over testing requirements with fire sprinkler contractor's representative.

#### TANK AUTO-FILL

- The approved fire sprinklers plans shall contain: Tank auto-fill, manual fill and emergency fill pipe sizing, valves, devices, means for testing and pipe schematic of the arrangement.
- The tank auto-fill valve design shall be approved by LADBS and LAFD during field inspection prior to testing. The design shall meet code requirements, the LAFD tank memo and installed to ensure safety and system maintenance is considered.
- The tank water level shall be below the low-water indicator level prior to the tank-fill testing in order to check alarm probe device under flow conditions.
- The testing of the auto-fill valve system shall be designed to allow the isolation of each auto-fill device to obtain maximum gpm flow readings in order to determine full replenishment and overflow drain termination sizing.
- After determining the auto-fill valves gpm, the tank will be filled completely to test the overflow system

#### TANK OVERFLOW

- Overflow drain for tank shall be sized based on the failure of the largest auto-fill valve
- The overflow drain shall terminate to an approved drain location by LADBS plumbing inspection
- The overflow drain shall use material approved for fire sprinkler installation
- If the overflow terminates to a sump pump, LAFD requires the sump pump has redundancy and is on emergency power.
- The operation of the overflow drain keeping up with the failure of the largest auto-fill valve shall be witnessed by LADBS and LAFD inspection.



# Questions and Answers